

REMARKS

A. Status of the Pending Application

Claims 1, 4, 10-20, 22-36 and 38-42 are pending. Claims 2-3, 5-9, 21, 37, and 43 have been withdrawn.

B. Claim Rejections

1. Claims 1, 4, 10-20, 22, 28-36, and 38

Claims 1, 4, 10-20, 22, 28-36, and 38 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Nojiri (U.S. Patent 4,640,585) in view of Rogers, Jr. et al. (U.S. Patent 4,859,492). Claim 1 is directed to a light transforming device having a graded index of refraction, comprising a body made substantially of a first amorphous material, the body having embedded therein a plurality of discrete structures comprising a second amorphous material, each of the discrete structures having a size in at least one dimension substantially smaller than an effective wavelength of light in the second material, wherein the first material has a first index of refraction and the second material has a second index of refraction different from the first index of refraction by at least $\Delta n = 0.5$, and wherein the size of the discrete structures in the at least one dimension is different in a first local region of the body than in a second local region of the body, thereby providing a graded index of refraction. Claim 10 is directed to light transforming device having a graded index of refraction, comprising a plurality of alternating layers of a first amorphous material having a thickness and a second amorphous material, each layer of the second material having a thickness substantially less than an effective wavelength of light in the second material, the first material having a first index of refraction, the second material having a second index of refraction different from the first index of refraction by at least $\Delta n = 0.5$, the plurality of alternating layers forming a light transforming medium with an effective index of refraction in a local region that depends on a local ratio of a volume of the layers of the first material to a volume of the layers of the second material, wherein a graded effective index of refraction along a direction transverse to the layers is formed by varying the thicknesses of the layers.

Claim 28 is directed to light transforming device having a graded index of refraction, comprising a plurality of alternating layers of a first amorphous material having a thickness and a second amorphous material, each layer of the second material having a thickness substantially less than an effective wavelength of light in the second material, the first material having a first index of refraction, the second material having a second index of refraction different from the first index of refraction, the plurality of alternating layers forming a light transforming medium with an effective index of refraction in a local region that depends on a local ratio of a volume of the layers of the first amorphous material to a volume of the layers of the second amorphous material, wherein a graded effective index of refraction along a direction transverse to the layers is formed by varying the thicknesses of the layers.

The Nojiri-Rogers combinations fails to disclose or suggest the use of amorphous materials in a light transforming device. Nojiri teaches alternating layers of GaAs with $\text{Ga}_{0.7}\text{Al}_{0.3}\text{As}$ layers, and states specifically that these layers are formed by growing thin film crystals. Col. 3, lines 6-64. Accordingly, these layers are crystalline, not amorphous as required by Claims 1, 10 and 28. If TiO_2 (anatase or rutile) or Ta_2O_5 (rhombic) are used as the second material, it will be recognized that these are also crystalline materials, not amorphous. Rogers' preferred material, lead silicate, alternating with layers of SiO_2 , is glassy and thus amorphous, but the layers then have only a Δn of about 0.2, rather than the required 0.5. The Office Action admits that most metal and ceramic materials used in semiconductor wafer production are polycrystalline and contain microscopic crystalline grains. Office Action, pp. 3-4. Accordingly, the references teach materials that are crystalline, not amorphous, as required by Claims 1, 10 and 28. Claims 1, 10 and 28 and dependent claims 4, 11-20, 22-27, 29-36 and 38-42 are therefore allowable. The Examiner is respectfully requested to withdraw the rejections of Claims 1, 4, 10-20, 22-36 and 38-42 and to allow the claims.

2. Additional Bases for Claims 23-27 and 39-42

Claims 23-27 and 39-42 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nojiri in view of Rogers Jr. et al. and further in view of Vawter et

al. (U.S. Patent 6,229, 947 B1) and Kawai et al. (U.S. Patent 6,345,138). The rejection states that Nojiri and Rogers disclose the material discussed above in the rejections of other claims, and admits that they do not disclose the limitations of Claims 23-27 and 39-42. The rejection then states that Vawter and Kawai disclose the limitations of Claims 23-27 and 39-42. Applicants respectfully disagree.

The fact that the references can be combined does not provide sufficient motivation for making the combination. The stated motivation in the Office Action is for transforming a planar wave to an elliptical one. Office Action, p. 6. Applicants do not understand how the motivation arises, since Nojiri discusses the difficulty of coupling an elliptical beam, and Vawter adds a monolithic structure to assist the coupling because of losses when coupling elliptical beams. Nojiri, col. 1, lines 12-18; Vawter, col. 1, lines 30-40. The references contradict the stated motivation for combining because one would not be motivated to transform planar waves into difficult-to-transform elliptical beams.

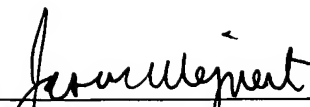
In any event, the Office Action does not specifically cite passages of Kawai or Vawter against particular limitations of any of Claims 23-27 and 39-42. Furthermore, "etching the planar waveguide into rib waveguides," is a teaching of Vawter, and is not one of the present claim limitations. Office Action, p. 6. Accordingly, the Office Action does not make out a prima facie rejection of Claims 23-27 and 39-42.

In addition, Claims 23-27 and 39-42 are allowable at least because they depend from allowable Claims 10 and 28, and because Nojiri and Rogers do not teach all the limitations of at least Claims 10 and 28. The rejection of Claims 23-27 and 39-42 is therefore improper. The Examiner is respectfully requested to withdraw the rejections.

C. Conclusion

Applicants respectfully submit that the pending claims are patentable, and therefore respectfully request allowance of the claims. The Examiner is invited to contact the undersigned Attorney via telephone if the Attorney can answer any of the Examiner's questions.

Respectfully submitted,



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